CHAIN

Centre for Health Equity Analytics

Shaping the Strategic Future of CHAIN: Advancing Research Innovation through the Centre of Excellence Application and the GUIDE Study

Terje Andreas Eikemo
Professor of Sociology
Editor-in-Chief, Scand J Public Health

"Medicine is social science and politics nothing but medicine on a grand scale"
-- Rudolf Virchow

“Medicine is social science and politics nothing but medicine on a grand scale.” — Rudolf Virchow

“Statistics are the eyes of the physician.” — William Farr

Social forces shape health, but statistical knowledge is what allows us to see, measure, and act on those forces.

CHAIN

Centre for Health Equity Analytics

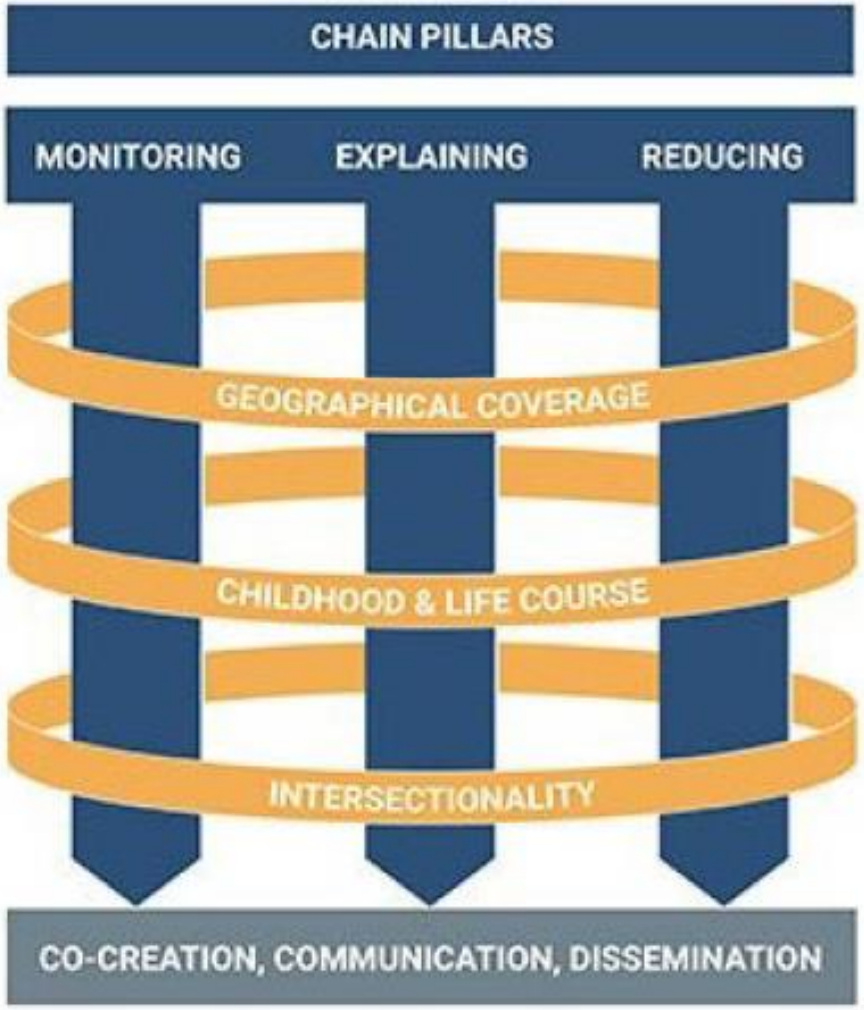
Summary report 2019 – 2025

CHAIN is financed by a strategic grant (miljøstøtte) from the Norwegian Research Council (project number 288638).

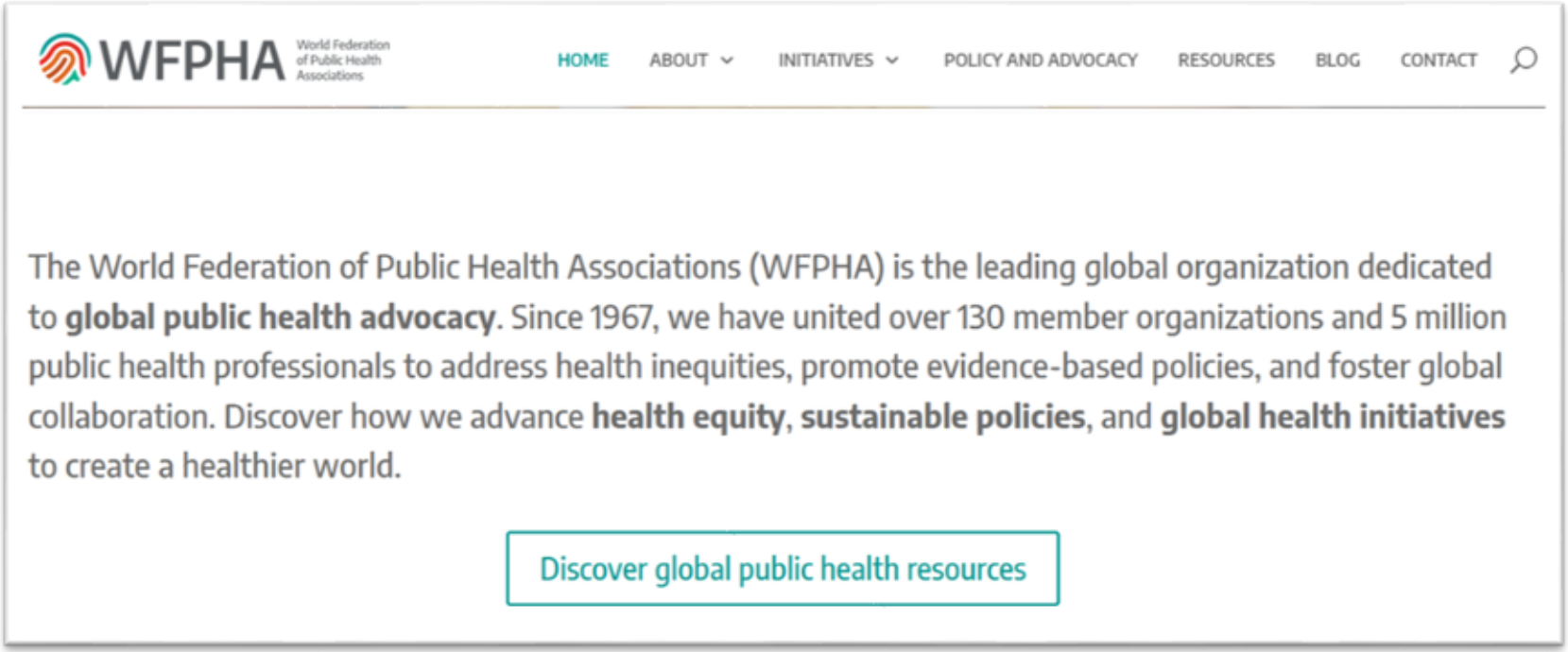
1.1 CHAIN structure

CHAIN works towards a global transformation in actionable health inequalities to

- **monitor** health inequalities, by describing the magnitude and variation of socioeconomic inequalities in health and mortality in the world through time and space.
- **explain** how these inequalities arise.
- **reduce** health inequalities by evaluating interventions that are effective in promoting health equity.
- **reduce the distance between research**, policy and practice through outreach activities.
- **develop the next generation** of health inequality researchers.



Possible new journal launch in September with WFPHA


WFPHA
World Federation of Public Health Associations
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ABOUT
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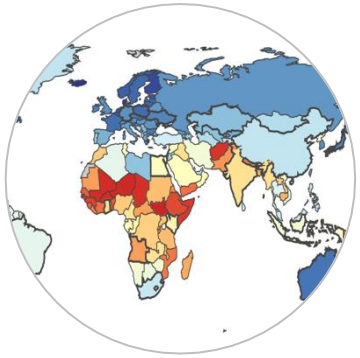
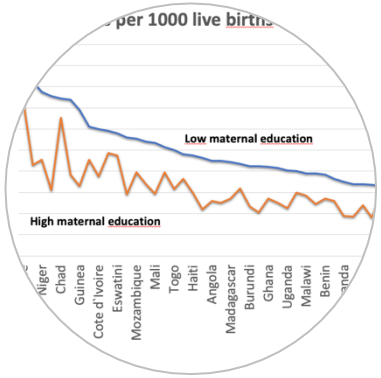
POLICY AND ADVOCACY
RESOURCES
BLOG
CONTACT
The World Federation of Public Health Associations (WFPHA) is the leading global organization dedicated to **global public health advocacy**. Since 1967, we have united over 130 member organizations and 5 million public health professionals to address health inequities, promote evidence-based policies, and foster global collaboration. Discover how we advance **health equity**, **sustainable policies**, and **global health initiatives** to create a healthier world.
Discover global public health resources

Monitoring



Explaining



Reducing

Examples:

Global health burden of low socioeconomic status (IHME) (Centre of Excellence application)

School mapping (UNICEF)

Development of large cross-national data infrastructures:
→European Social Survey
→CHAIN-Erasmus data
→Systematic reivews
→GUIDE Child Cohort Study

Effects of inequality on covid-19-mortality world-wide (UN and WHO)

Vaccine nationalism

Technological innovations

Consequences of school closures (UNESCO Chair)

CHAIN

JAHEE - Effects of interventions (EC Commission)

Effects of cash transfers in Lesotho (UNICEF)

Healthy Environments Framework Report (UNICEF)

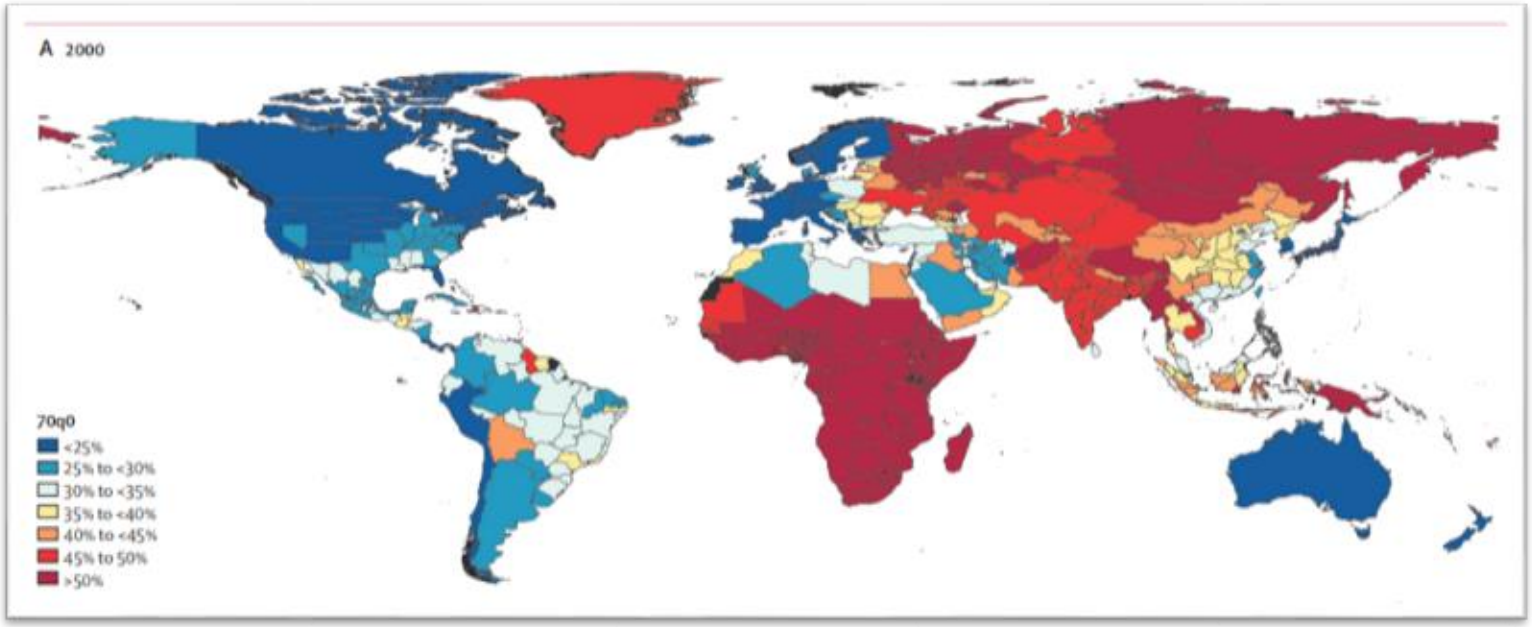
Implementation research (UNICEF)

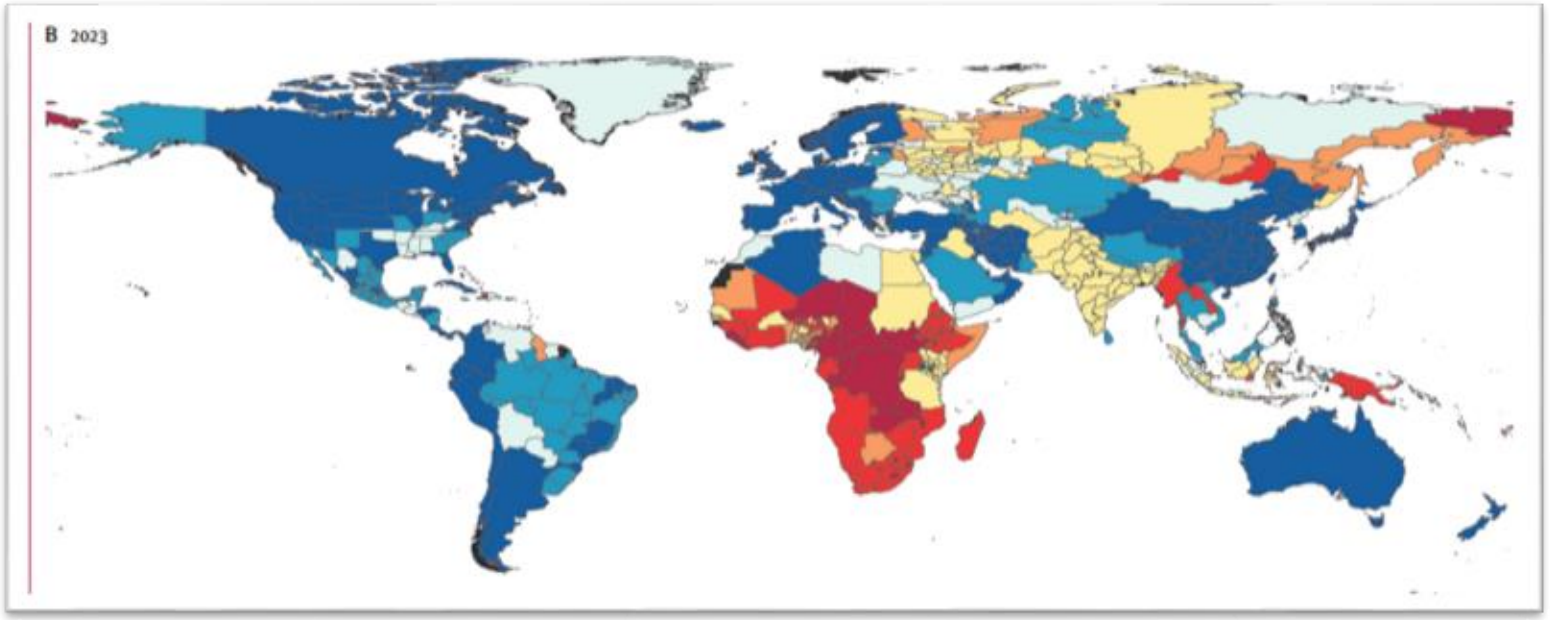
Analysis of soil samples in refugee camps (aid agencies)

Norwegian Centres of Excellence scheme

The SFF scheme gives Norway's leading researchers the opportunity to organise themselves into centres to achieve ambitious scientific goals. The research shall move the international research front, be innovative and groundbreaking. Centres are funded for up to ten years (six + four years).

Probability of death before age 70 years





Global burden of 292 causes of death in 204 countries and territories and 660 subnational locations, 1990–2023: a systematic analysis for the Global Burden of Disease Study 2023

THE LANCET
Volume 398, Issue 10300, 14–20 August 2021, Pages 608-620

Articles

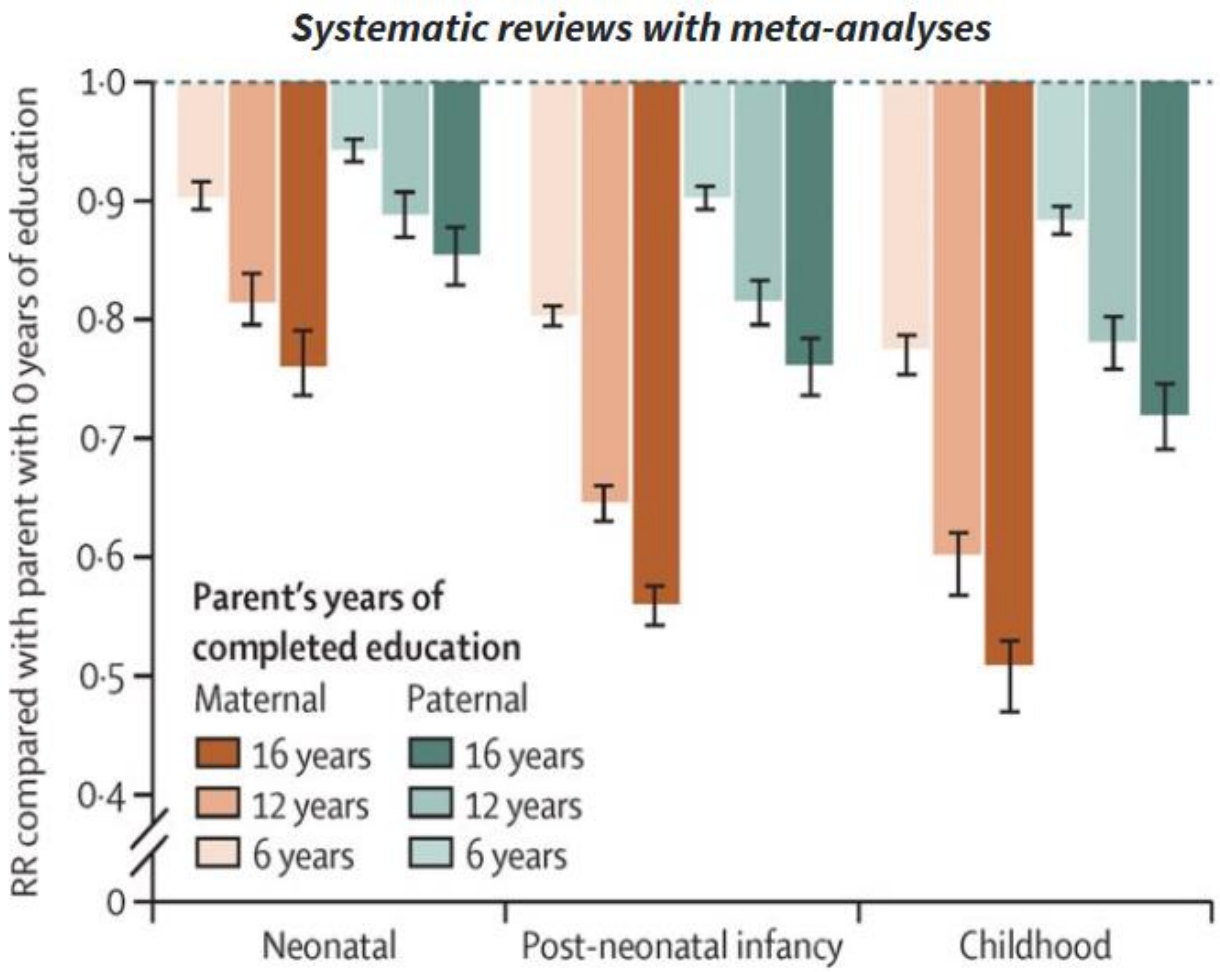
Parental education and inequalities in child mortality: a global systematic review and meta-analysis

Mirza Balaj PhD [a*], Hunter Wade York MPH [b, d*], Kam Sripada PhD [a*], Elodie Besnier MA [a], Hanne Dahl Vonen [a], Aleksandr Aravkin PhD [b, c, e], Joseph Friedman MPH [b, f], Max Griswold MA [g], Magnus Rom Jensen MA [h], Talal Mohammad MSc [a], Erin C Mullany BA [b], Solvor Solhaug MA [h], Reed Sorensen MPH [b, e], Donata Stonkute MSc [a], Andreas Tallaksen cand.psych [i], Joanna Whisnant MPH [b], Peng Zheng PhD [b, e], Prof Emmanuela Gakidou PhD [b, e, †] ✉, Prof Terje Andreas Eikemo PhD [a, †] ✉

Show more

Children's chances of surviving their first five years increase for every year of education of their parents

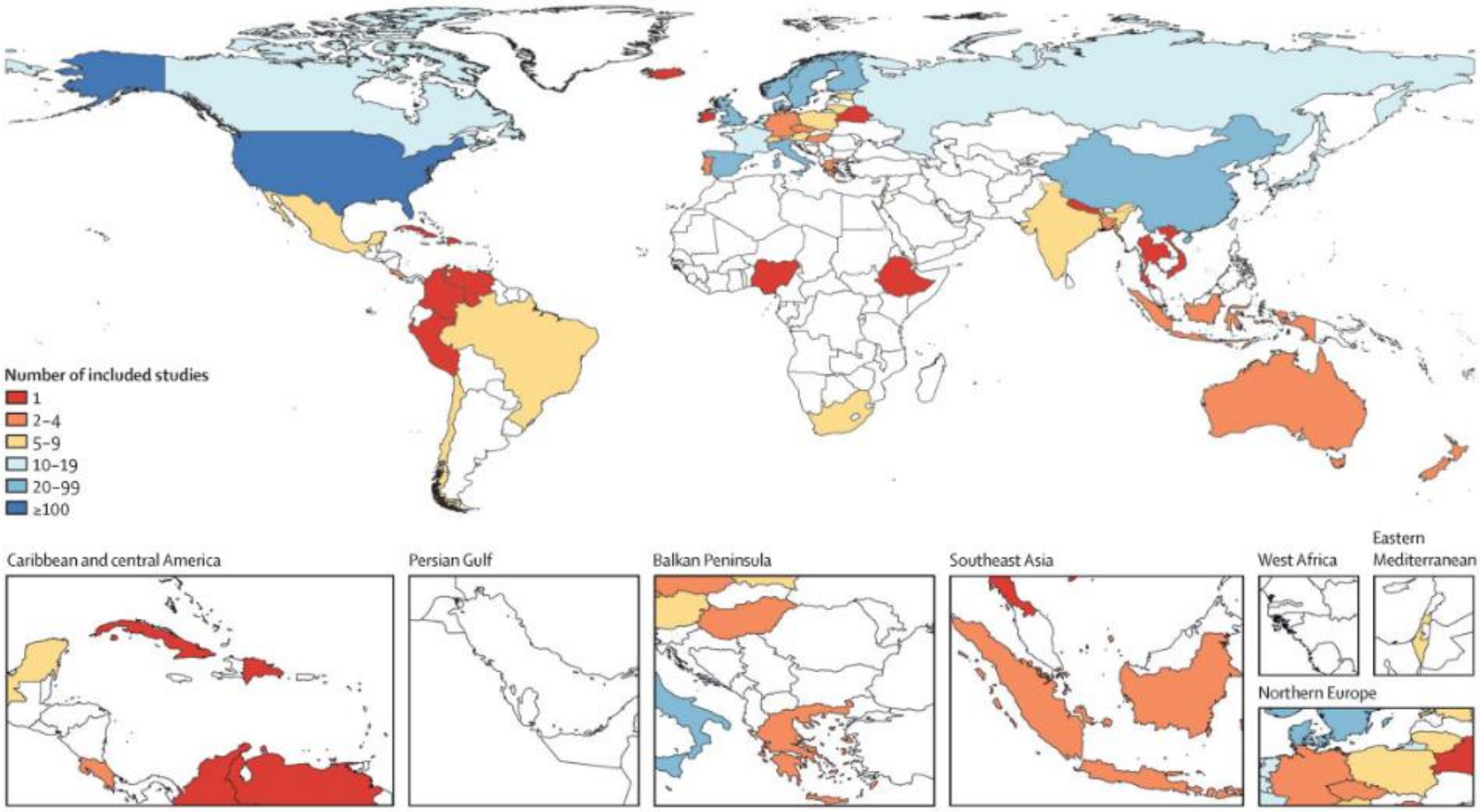
Balaj M, et al. Parental education and inequalities in child mortality: a global systematic review and meta-analysis. Lancet 2021;398:608-20.



- Reduction in under-5 mortality of 31% for children born to **mothers** with 12 years of education
- Reduction in under-5 mortality of 17·3% for children born to **fathers** with 12 years of education

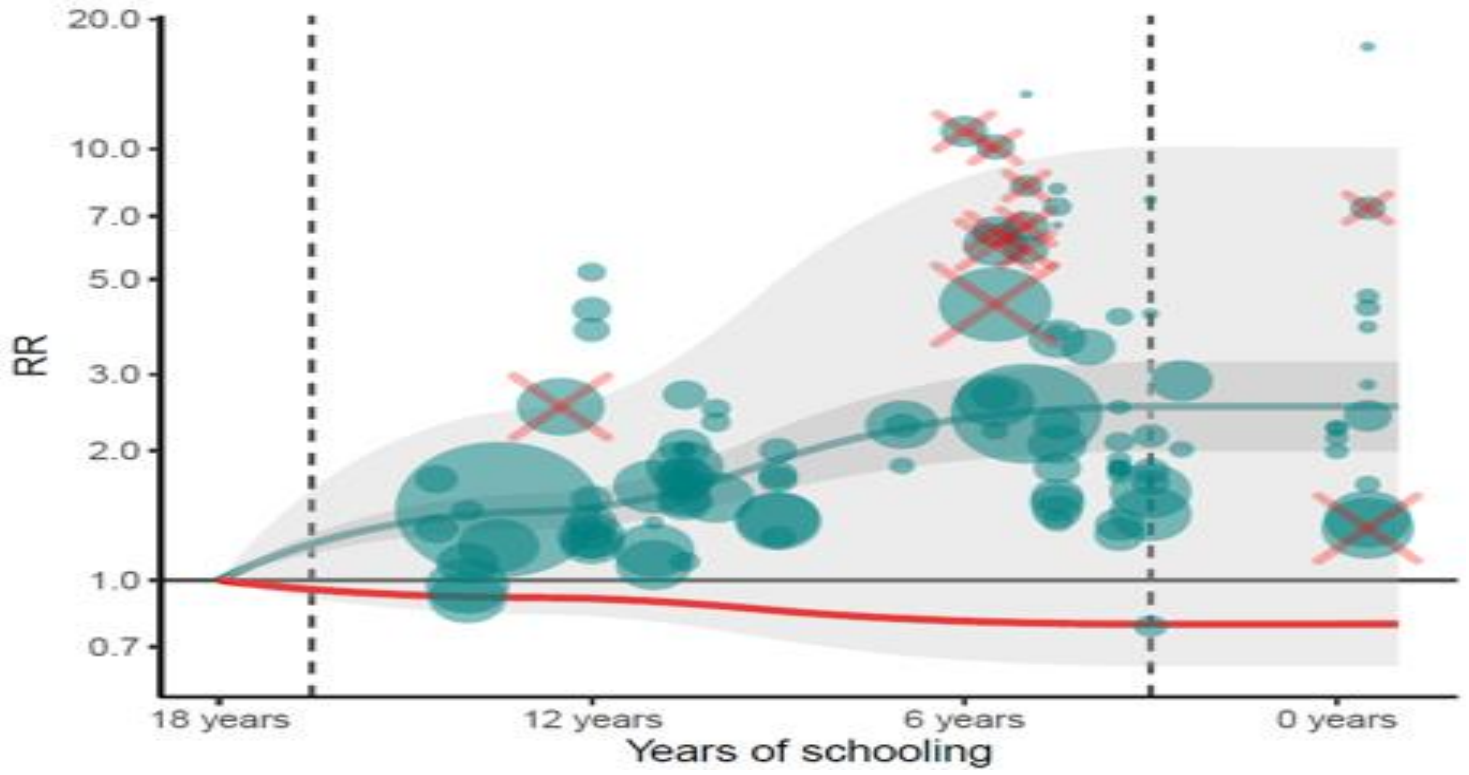
THE LANCET
Public Health

Authors:
Balaj, Mirza; Henson, Claire A.; Aronsson, Emma Amanda; Aravkin, Aleksandr Y.; Beck, Kathryn Christine; Degail, Claire Josette Edith; Donadello, Lorena; Eikemo, Kristoffer; Friedman, Joseph; Giouleka, Anna; Gradeci, Indrit; Hay, Simon, I.; Jensen, Magnus Rom; Mclaughlin, Susan A.; Mullany, Erin C.; O'connell, Erin M.; Sripada, Kam; Stonkute, Donata; Sorensen, Reed J.D.; Solhaug, Solvor; Vonen, Hanne Dahl; Westby, Cèline Lossius; Zheng, Peng; Mohammad, Talal; Eikemo, Terje Andreas; Gakidou, Emmanuela.


Number of included studies
1
2–4
5–9
10–19
20–99
≥100
Caribbean and central America
Persian Gulf
Balkan Peninsula
Southeast Asia
West Africa
Eastern Mediterranean
Northern Europe

Educational inequalities in COVID-19 mortality: A global systematic review and meta-analysis

Insa Backhaus-Hoven[1*], Claire Henson[2*], Talal Mohammad[1], Pilar Vidaurre-Texidó [1], Brigid Unim[3], Hanno Hoven[1,4], Jalal Arabloo[5], José Chen-Xu[6], Emma Joanna Lengle[7], Agustina M. Marconi[8], Andreea Badache[9], Orsolya Varga[10], Carl Michael Baravelli[11], Julia M. Jackman[12], Nicole Quattrini[1], Hugo-Alejandro Santa-Ramírez[13] Che Henry Ngwa[14], Stéphane Cullati[15], Delphine S. Courvoisier[16], Mary Economou[17], Diana Alecsandra Grad[18], Tina Lesnik[19], Rafael José Vieira[20], Javier Muñoz Laguna[21], Tim Huijts[22], Amelia Stokke Grønseth[1], Theophilus I. Emeto[23], Ahmed Taha Aboushady[24], Gülcan Tecirli[25], Oyelola Adegboye[26], Jinane Ghattas[27], Roberto Iacono[28], Magnus Rom Jensen[29], Solvor Solhaug[29], Lene Elisabeth Bertheussen[29], Anne Lillevoll Lorange[29], Hilde Kaalvik[29], Lisbeth Jahren[29], Emmanuela Gakidou[2], Terje Andreas Eikemo[1**] and Mirza Balaj[1**]

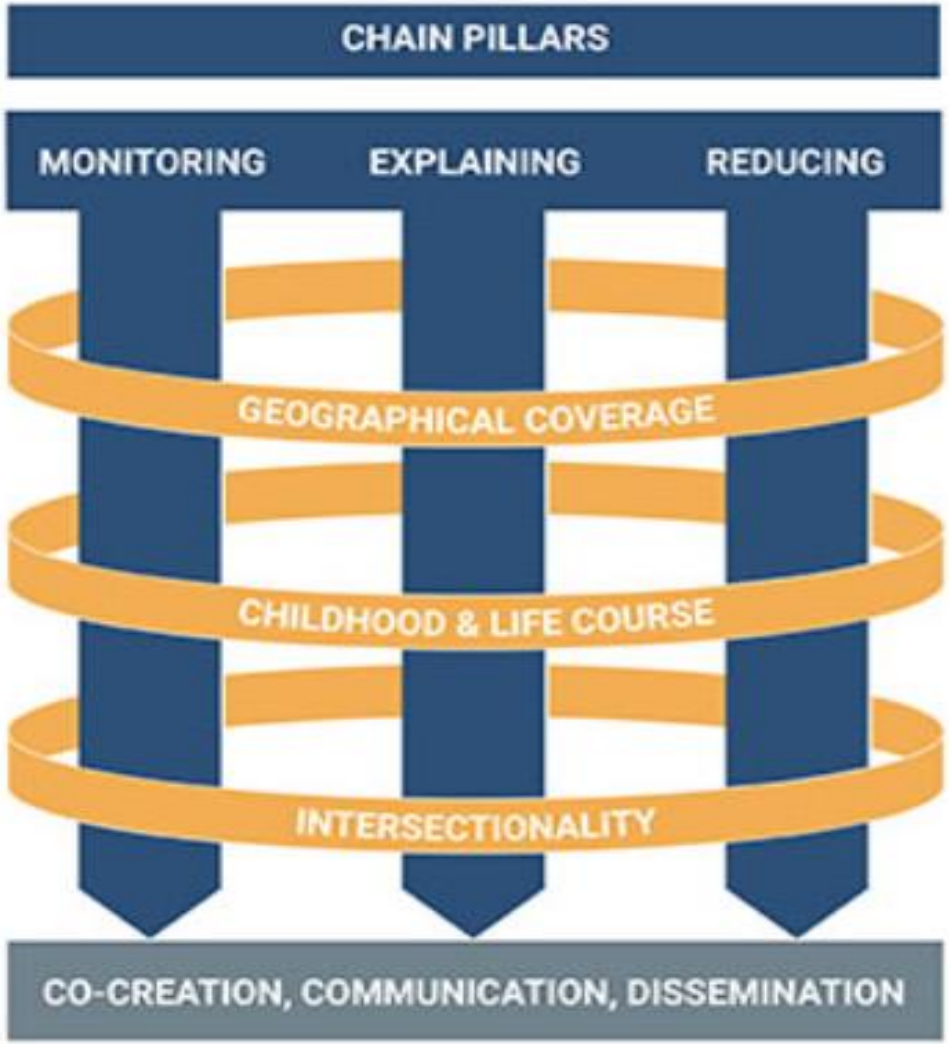


CHAIN CoE 3.0

NFR CHAIN project 2018 – 2025 has established

- ***education as a universal global determinant of child and adult mortality***
- ***CHAIN as the global epicenter of health inequalities research: we lead the largest network and have the best data.***

- ***Key partners: UN (UNICEF and WHO), IHME, EuroHealthNet, FHI (Bergen), LSE***
- ***Our global data warehouse links social risks to morbidity and mortality at the individual level.***
- ***Next steps are easy to identify, they are important for global health research and policy and only we can do it.***



→ *Forecasting*

NTNU

CHAIN

IHME

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Global Burden of Disease (GBD)

The GBD study is the largest and most comprehensive effort to quantify health loss across places and over time, so health systems can be improved and disparities eliminated.

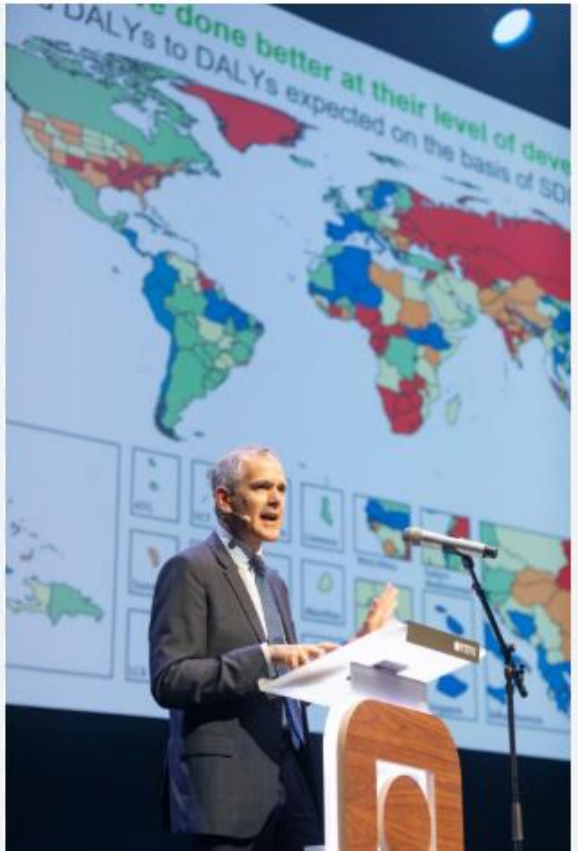
607 billion+
highly standardized and comprehensive estimates measure health outcomes and systems.

463
health outcomes and risk factors, provide a powerful basis for insights on global health trends and challenges.

204
countries and territories, plus dozens of subnational locations show trends at regional, national, and local levels.

17,000+
individuals from 167 countries and territories collaborate in vetting GBD data sources and estimates.

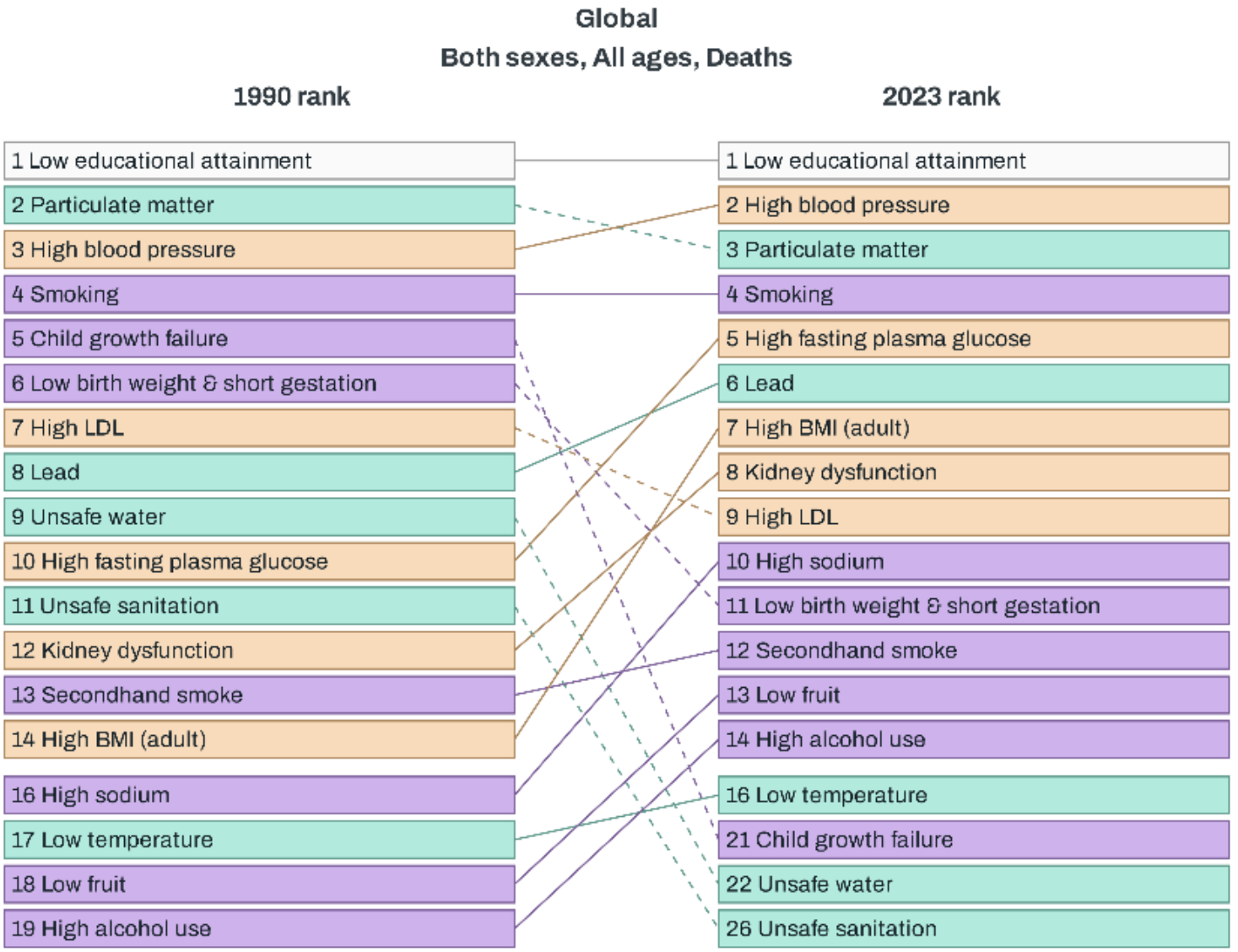
CHAIN-IHME collaboration



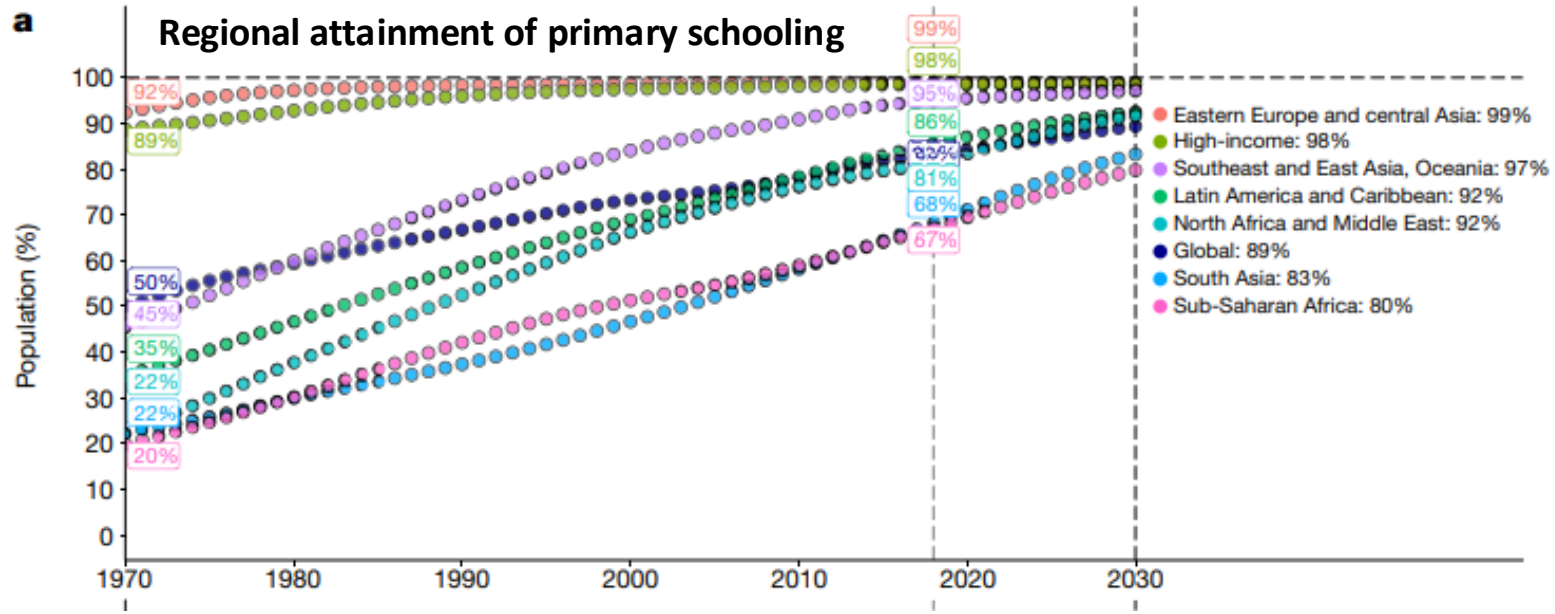
C. Murray, Trondheim, 2018
Big Challenge

C. Murray and E. Gakidou, Trondheim 2025
Recipients of honorary doctorates bestowed by NTNU

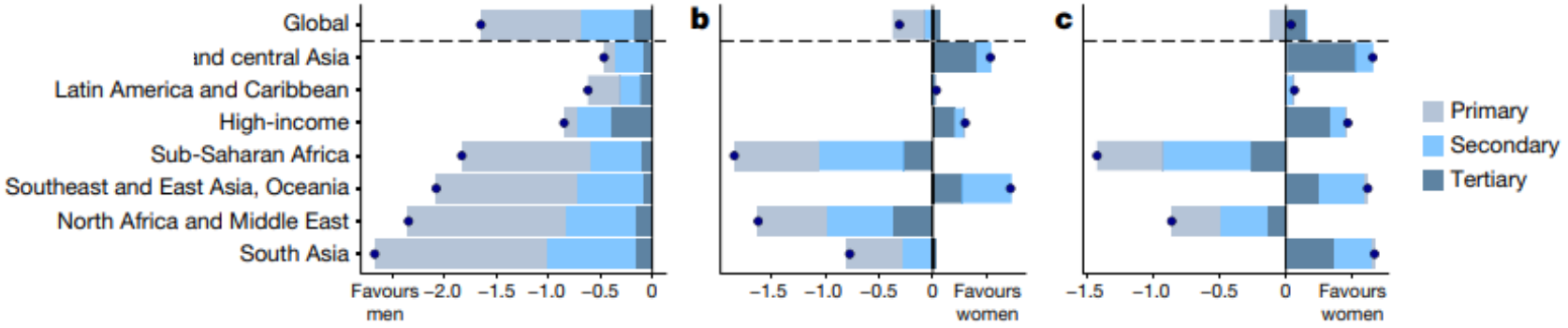
Preliminary confidential analysis (GBD rank)



The problem CHAIN will address



Gender gaps in schooling



Friedman, J. et al. Measuring and forecasting progress towards the education related SDG targets. Nature 580, 636–639 (2020)

CHAIN will close this knowledge gap by integrating interdisciplinary methods, probabilistic forecasting, and direct policy engagement.

By examining how education shapes both fatal and non-fatal health outcomes over time (1990–2050) and across space (over 600 subnational regions)—and how these relationships evolve in response to policy interventions—CHAIN will identify the most effective cross-sectoral, regional, and population-level strategies to reduce social disadvantage and strengthen resilience in the face of economic and environmental challenges, health crises, and shifting donor priorities.

Stoltenberg-utvalgets-rapport-november-2024
pdf · 1 MB

Norges lederskap redder millioner av liv

Bill Gates
Grunnlegger av Microsoft

Aldri før har verden hatt større behov for Norges moralske lederskap. Norske ledere har også en tydelig visjon for veien videre.

Forrige måned publiserte et ekspertutvalg ledet av Camilla Stoltenberg en ny rapport som viser hvordan Norge kan ta en lederrolle i den neste globale helserevolusjonen.

Rapporten peker på to hovedmål for Norge:

- *For det første å redusere helseforskjellene mellom verdens rikeste og fattigste nasjoner*

- *For det andre å styrke helsesikkerheten – både i Norge og i resten av verden*

Globale helseinvesteringer bidrar også til økt global velstand. Når barn er friske, kan de gå på skole.

Når voksne er friske, kan de gå på jobb. Og når samfunn er friskere, vokser og blomstrer økonomien

Bill Gates i Aftenposten, 081224

Primary and secondary objectives of the Centre

The **primary objective** is to establish an internationally leading Centre that advances innovation in global health equity research, generating evidence-informed solutions to reduce health inequalities worldwide.

Secondary objectives:

(1) forecasting educational attainment across 600+ subnational regions and estimating its impact on the global disease burden by age group, sex and region from 2028 until 2050 (Module 1);
(2) establishing clear causal links between educational policies, education and health outcomes across diverse socioeconomic contexts (Modules 2–3);
(3) forecasting and evaluating the impact of education policies as well as other complementary policies on health equity (Module 4);
(4) translating this evidence into actionable, tailored guidance for governments, donors, and international organizations (Module 5).

All objectives are supported by statistical innovations (Module 6) for robust modeling and uncertainty quantification, and better data coverage (Module 7).

Centre for Health Equity Analytics (CHAIN)

Centre Directors

Professor Terje Andreas Eikemo and Professor Andrea Riebler, Norwegian University of Science and Technology (NTNU), Trondheim, Norway

Group leaders (PIs)

Terje Andreas Eikemo (SU), Andrea Riebler (SU), Sara Martino (IE), Indra De Soysa (SU), Emilie Courtin (LSE), Stein Emil Vollset (FHI), Emmanuela Gakidou (IHME)

Humanities and Social Sciences: (1) Life Sciences: (2)

Key expertise: sociology, education, political economy of development, social policy, and aid, epidemiology and forecasting, policy evaluation and causal inference, statistical modeling, health economics.

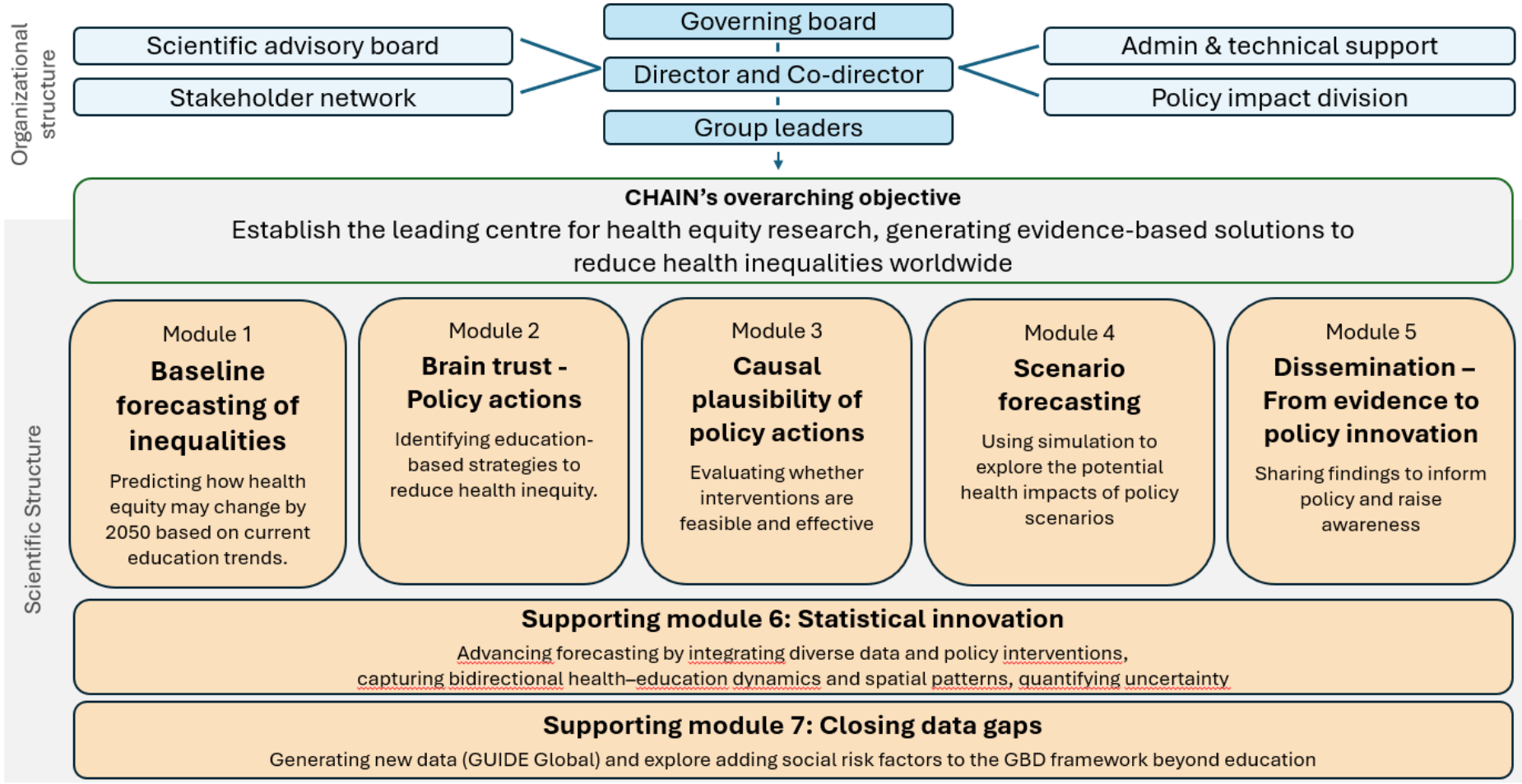


Figure 2: Organization of CHAIN

Module 1: Baseline forecasting of inequalities, led by PI Vollset (FHI) and Co-PIs Riebler (IE faculty) and Gakidou (IHME)

- It will create harmonized forecasts of educational attainment by sex, age, and region through 2050 for over 600 subnational areas worldwide.
- It will create the first globally comparable, quantitative outlook on the evolution of health inequalities under current educational trends.
- The module aims to standardize fragmented data systems, allowing consistent projections of how educational inequalities affect population health.
- It will also analyze the interaction between education and behavioral risks, requiring ongoing interdisciplinary collaboration.

Module 2: Brain trust of policy actions, led by Eikemo and de Soysa (SU faculty)

- Will provide the critical interface between empirical evidence and policy design—ensuring that CHAIN's forecasts inform real-world decision-making.

- Acting as a collaborative "brain trust", Module 2 will engage CHAIN's Stakeholder Group—to identify the most pressing policy questions emerging from the inequalities revealed in Module 1.

- Policy scenarios will be organized into two broad categories:
  1) *Population-level interventions*, such as extending compulsory education, adapting curricula to digital transitions, or strengthening national health programs; and
  2) *Targeted interventions for specific subpopulations*, such as adult lifelong learning programs, health-promoting schools, risk-based cancer screening, or community-based health initiatives.

- Key stakeholders: Norad, the Norwegian agency for development cooperation (3ie), EuroHealthNet, Langsikt, the UNESCO Chair *Global Health & Education*, UNICEF Norway, UNICEF Innocenti, the WHO Health Equity Unit, the WHO Health Inequality Monitoring Network (WHO HIM), and the World Federation of Public Health Associations (WFPHA).

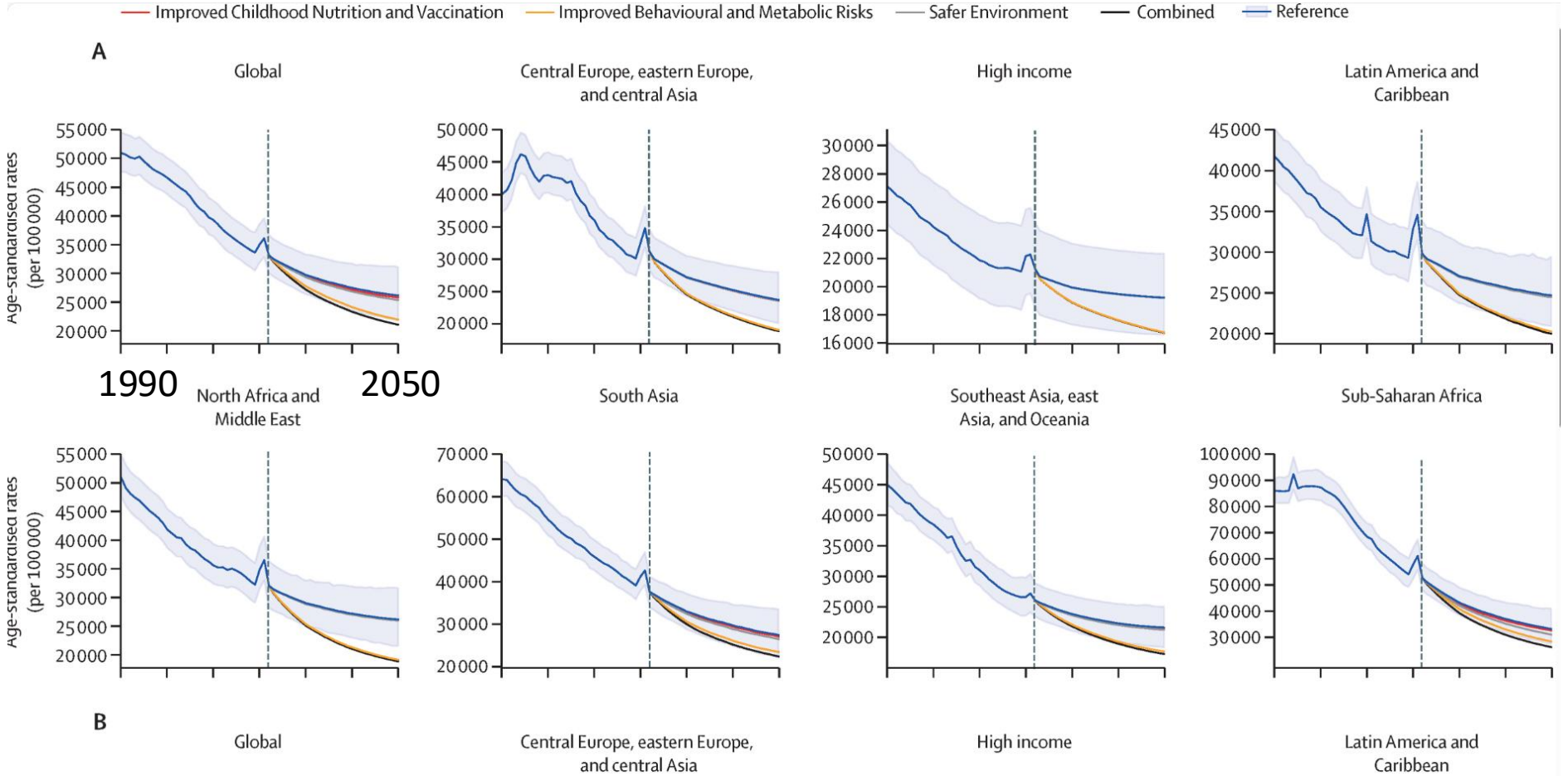
Module 3: Identify causal plausibility, led by PI Courtin (LSE), Co-PIs: De Soysa (SU faculty) and Gakidou (IHME)

- Module 3 assesses the plausibility and transferability of policy scenarios from Module 2 as viable real-world interventions.
- It will act as a *filter* to identify scenarios supported by robust empirical evidence for inclusion in Module 4's modeling framework.
- The module aims to generate new causal evidence to refine scenarios and employs qualitative data, systematic reviews, and advanced methods like machine learning.
- It will evaluate whether proposed policies improve educational attainment and health outcomes, while also examining their contextual transferability across regions.
- Each scenario will receive a credibility score to ensure only the most evidence-supported policies advance to Module 4 for forecasting and simulation.

Module 4: Scenario forecasting, led by PI Martino (IE faculty) and Co-PIs Vollset (FHI) and Riebler (IE faculty).

- Will forecasts how policy scenarios identified in Module 2, and evaluated in Module 3, could reduce global health burdens in over 600 regions by 2050.
- Will produce actionable insights on the impact of education-driven policies on 100 health outcomes and 89 mediating risk factors.
- The module establishes a new global standard for forecasting policy impacts, using a 1–5 star rating system to assess evidence quality and ensure scientific rigor.
- Forecasting models will be updated every two years, with stakeholder collaboration to refine policy questions based on the latest data and projections.

Example



[Burden of disease scenarios for 204 countries and territories, 2022–2050: a forecasting analysis for the Global Burden of Disease Study 2021 - The Lancet]

Module 5: translating results into actionable policy, led by PI De Soysa (SU faculty) and Co-PI Eikemo (SU faculty).

- will ensure that CHAIN's scientific results inform global, regional, and national policy processes through a coherent strategy that links health and education as mutually reinforcing systems for human development

- Recognising that learning and wellbeing are interdependent, the module will advance integrated policy innovation, avoiding siloed approaches and promoting cross-sectoral solutions that strengthen both sectors simultaneously.

- Pioneering co-design approaches will engage stakeholders to establish priorities and create integrated policy briefs, supported by a multidisciplinary Policy Impact Division (led by EuroHealthNet).

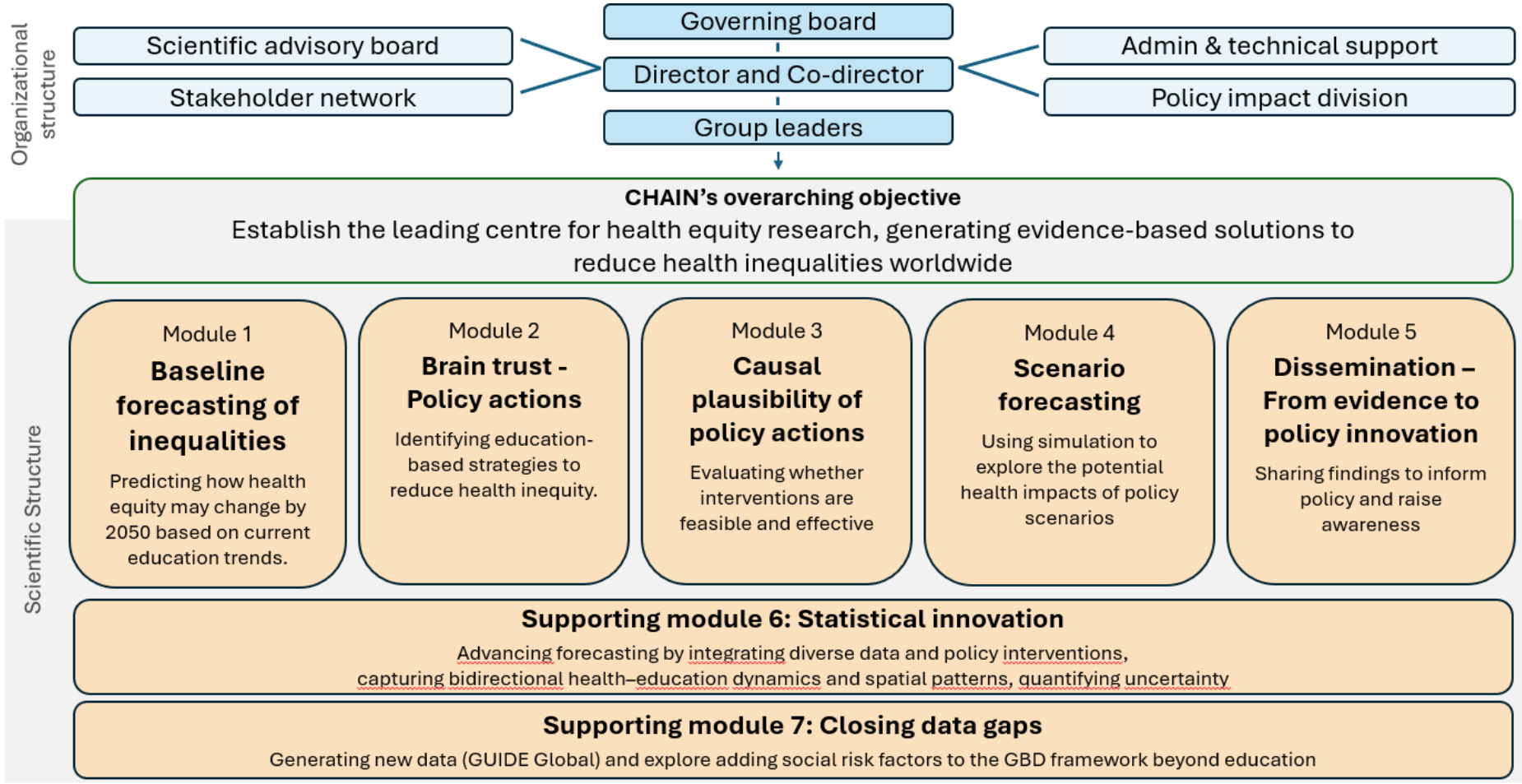


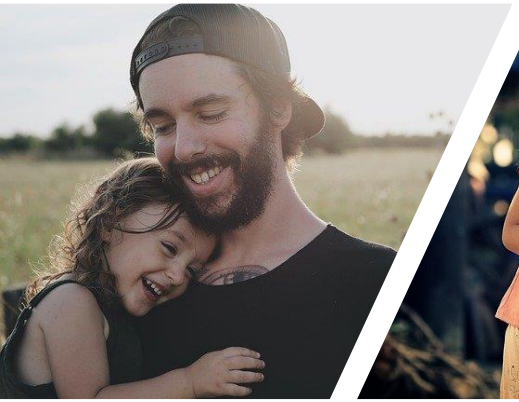
Figure 2: Organization of CHAIN

Growing up in digital Europe (Guide)
– Why do we need a European birth cohort

Prof. Terje Andreas Eikemo

- Professor of Sociology, NTNU
- Leader, CHAIN
- Editor-in-Chief, Scand J Public Health

20th Biennial ESHMS conference 2024, Antwerp, Belgium





The first Europe-wide longitudinal study of children

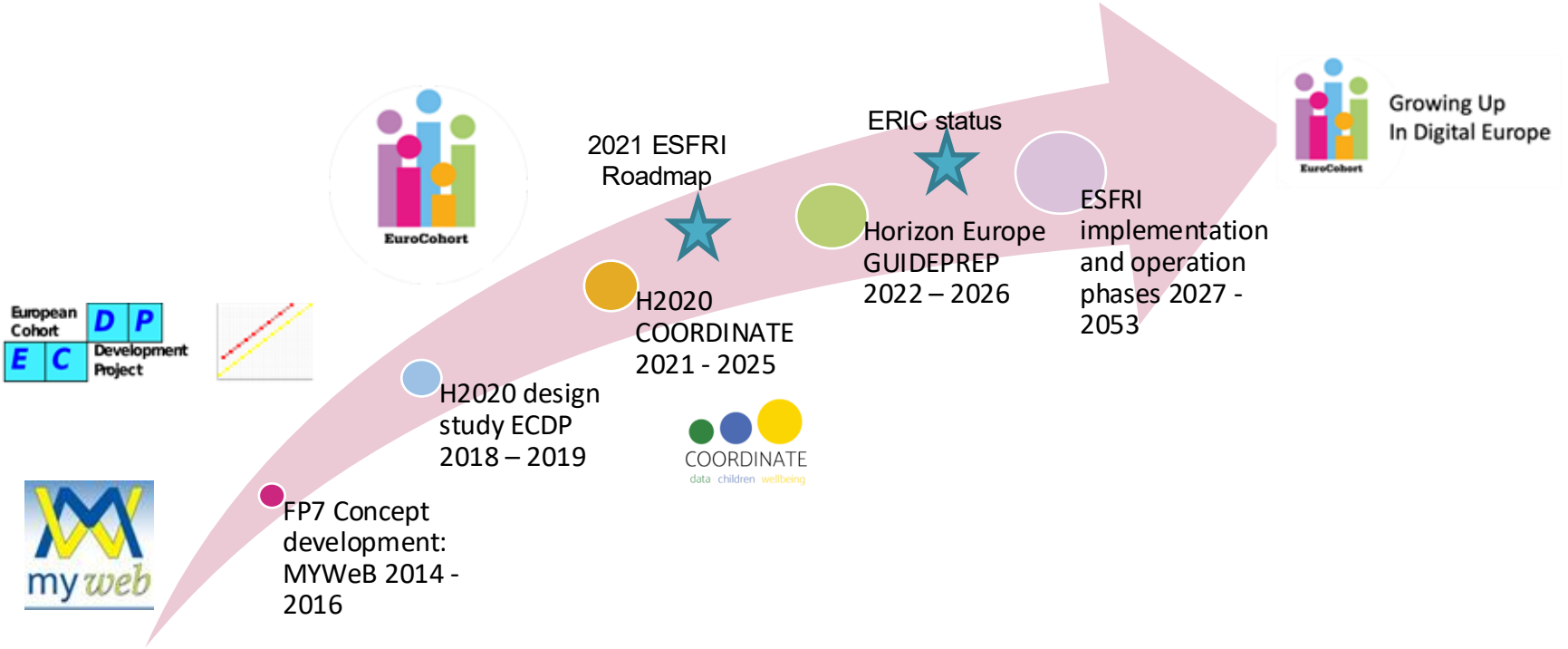
Growing Up In Digital Europe (GUIDE)

Growing Up in Digital Europe

High quality comparative data on child wellbeing	Europe's only longitudinal cohort survey of child wellbeing	Accelerated cohort design
• Harmonised instruments • Longitudinal coverage	• 28 partner countries • National Nodes • Central Hub	• Child cohort age 8 in 2027 • Infant cohort age 9 months in 2029

This project has received funding from the European Union's Horizon Europe Research and Innovation programme under grant agreement No 101078945

Building the largest social science research infrastructure in Europe



Why we need GUIDE

Growing Up in Scotland

Global Longitudinal Research Initiative

UNICEF, Innocenti, Italy

CHILD OF THE NEW CENTURY

United Kingdom

GUIDE

Growing Up in Digital Europe

Growing Up in Ireland

National Longitudinal Study of Children

TREE

Transitions from Education to Employment, Switzerland

moba

Mother and Child Cohort Study Norway

Generation R

Netherlands

NEXT STEPS

United Kingdom

NEPS

National Educational Panel Study

Germany

SFI

Danish Longitudinal Study of Youth

COHORT '18

Growing Up in Hungary

STATENS SERUM INSTITUT

Danish National Birth Cohort Study

ined

INSTITUT NATIONAL D'ÉTUDES DÉMOGRAPHIQUES

ELFE: French Longitudinal Study of Children

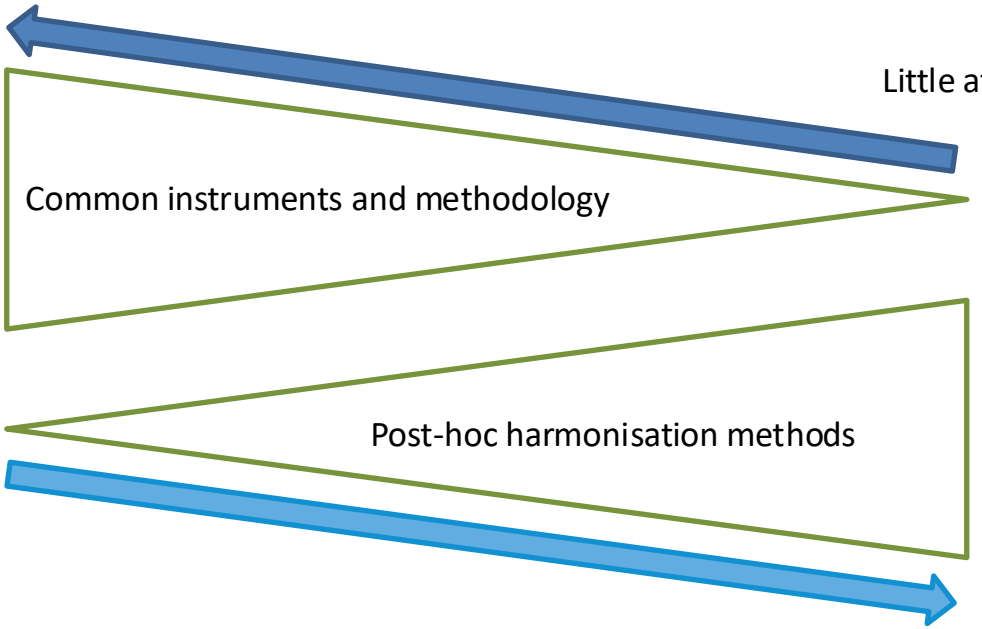
Survey comparability

GUIDE

Fully harmonised
High comparability

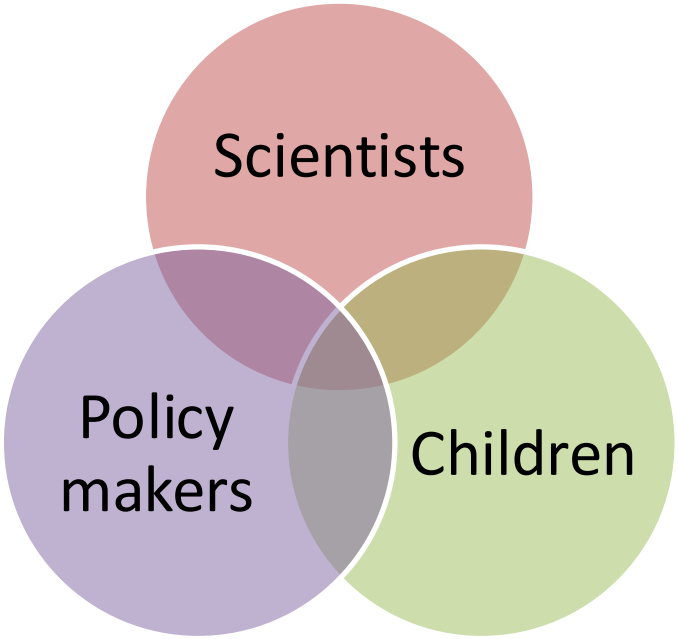
Previous Studies

Little attempt to harmonise
Low comparability



GUIDE overview of research design

Designing GUIDE



GUIDE methodology

- Questionnaire content is policy focused
- Input harmonized for comparative analysis
  - Common questionnaires
  - Common data collection procedures and time frame
- Children and young people involved in the design
- Accelerated cohort design
  - Cohort 1: 8-year-old children and their main carer
  - Cohort 2: 9-month-old children and their main carer
- Nationally representative samples
- Open access to data

Wave 1

COVID Cohort 1: Child Cohort (8 years old)

Child Questionnaire

1 Psychological well-being
2 Emotional wellbeing
3 Physical wellbeing
4 Social wellbeing
5 Family and home
6 Friendships
7 School
8 Neighbourhood
9 Material conditions
10 Activities
11 Health
12 Children's rights and voice

Parent Questionnaire

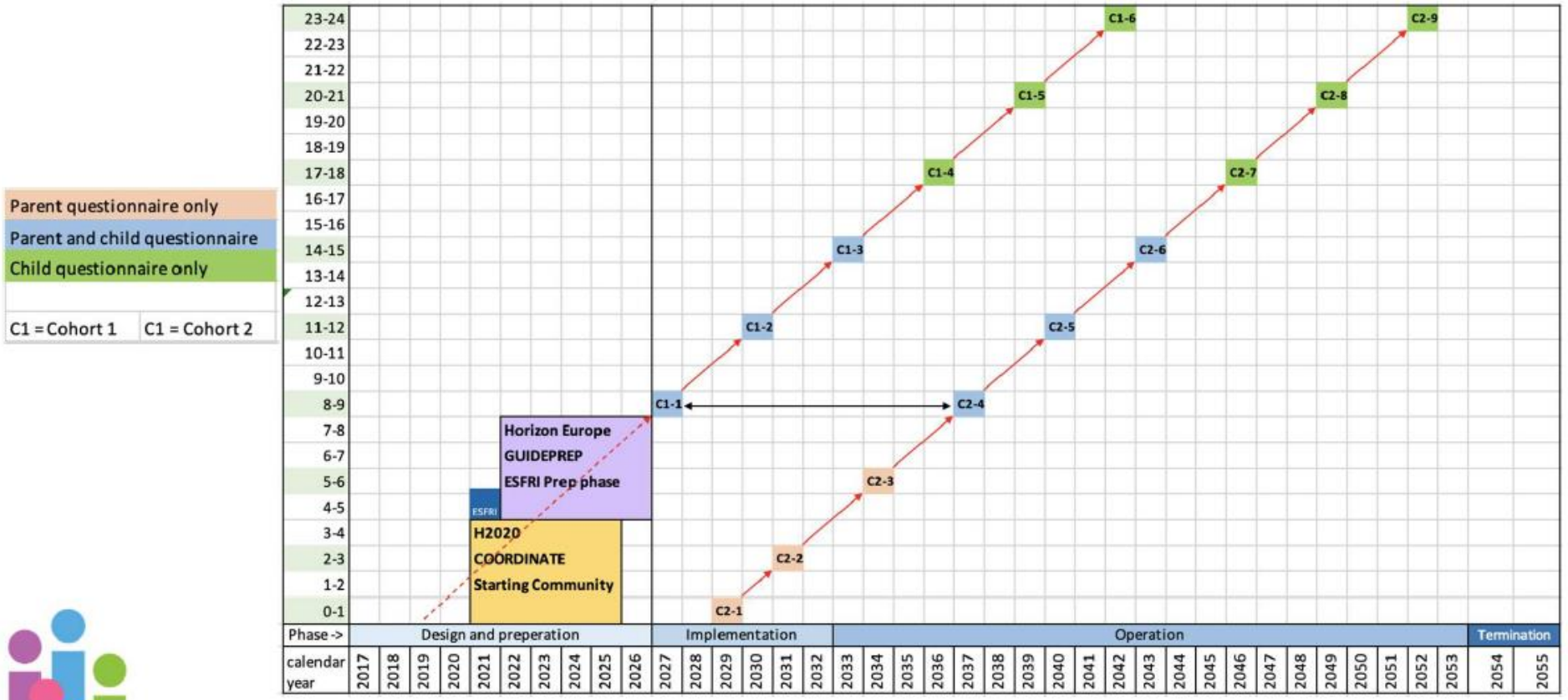
1 Household Information
2 Socio-Demographics
3 Childcare, Parental Support and Parenting
4 Child's Education
5 Child's Activities
6 Pregnancy and Birth
7 Child's Health and Well-Being
8 Health and Well-Being
9 Employment and Socio-Economics
10 Housing, Neighbourhood and Community

Cohort 2: Birth (9 months)

Parent Questionnaire

1 Household Information
2 Socio-Demographics
3 Childcare and Parental Support
4 Child Functioning and Relationships
5 Baby's Development and Habits
6 Pregnancy and Birth
7 Baby's Health and Nutrition
8 Health and Well-Being
9 Employment and Socio-Economics
10 Housing, Neighbourhood and Community

Digital life


Parent questionnaire only
Parent and child questionnaire
Child questionnaire only
C1 = Cohort 1
C1 = Cohort 2
23-24
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Horizon Europe
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ESFRI
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COORDINATE
Starting Community
Phase ->
Design and preperation
Implementation
Operation
Termination
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Questionnaires developed

- Questionnaire for parents/guardians of new-borns (up to 9 months old children)
- Questionnaire for 8 years old children
- Questionnaire for parents/guardians of 8 years old children

Sample design

Probability sample

- For each cohort, a sample of children resident in the country within the relevant **one-year age** range

Sample design

- Varies between countries and cohorts, to recognise **national availability,** adhering to common principles and parameters

Common prescribed level of statistical precision

- For each national sample design (which will depend on sample size, stratification, selection probabilities and clustering)

Sampling principles, guidelines and parameters

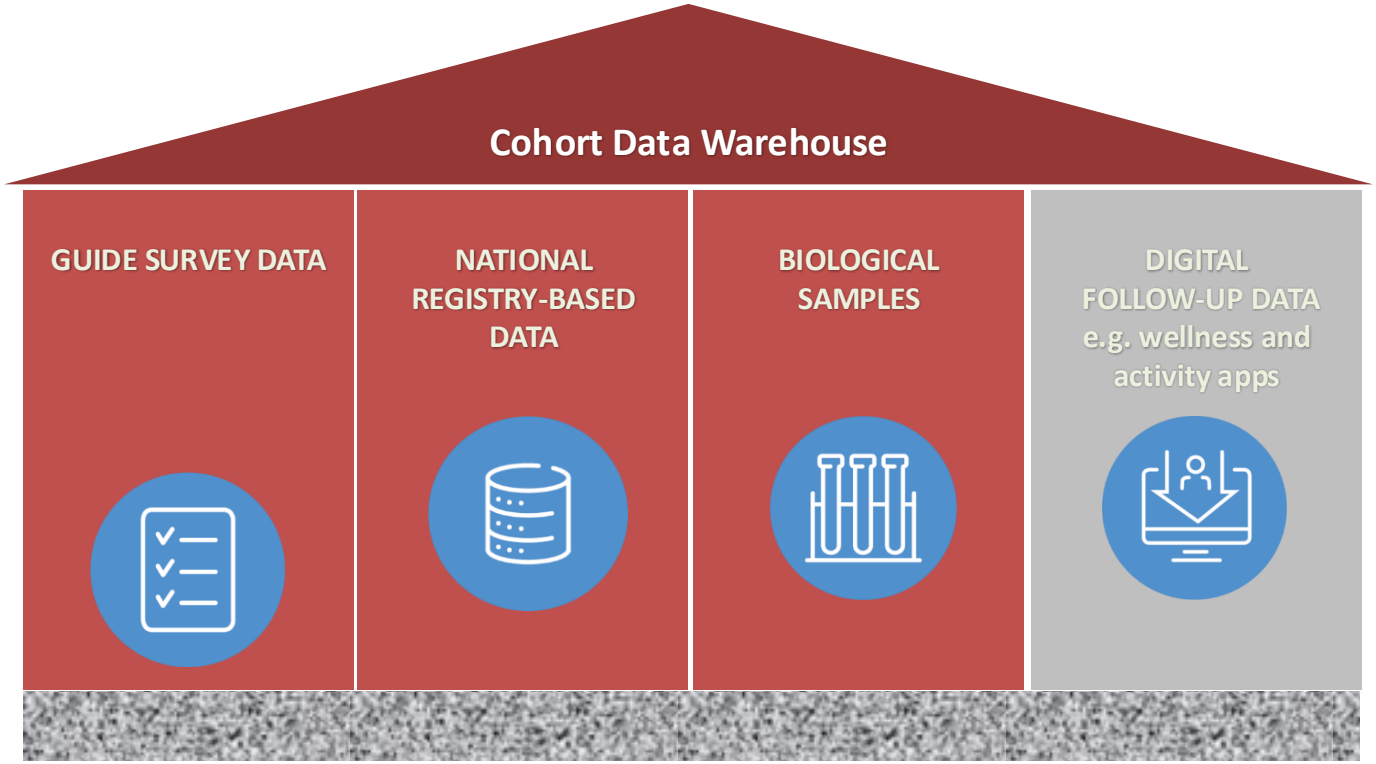
- agreed by the central team, who will work with each national team to develop and approve an acceptable sample design

Sample size

Attrition rates will differ over a 25-year period for both cohorts and between countries. In setting the **initial target sample sizes** for each cohort it is necessary to anticipate likely levels of attrition in such a way as to ensure that the **later data collection waves retain sufficient respondents for inferential statistical analysis**

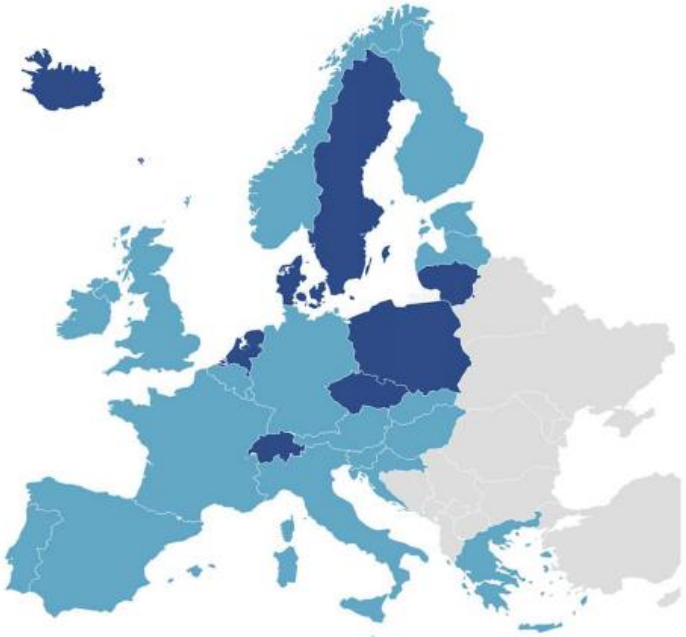
We propose that wave 1 **minimum effective sample size** should be set at 1**0,000** for the birth cohort (C2) and **8,000** for the childhood cohort (C1), with a waiver for the **smallest countries**, for whom the effective sample size will be not smaller than **5,000** for the birth cohort and **4,000** for the childhood cohort

GUIDE survey data integration



GUIDE Consortium

Extended GUIDE Consortium



Partners
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Croatia
Estonia
Finland
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Greece
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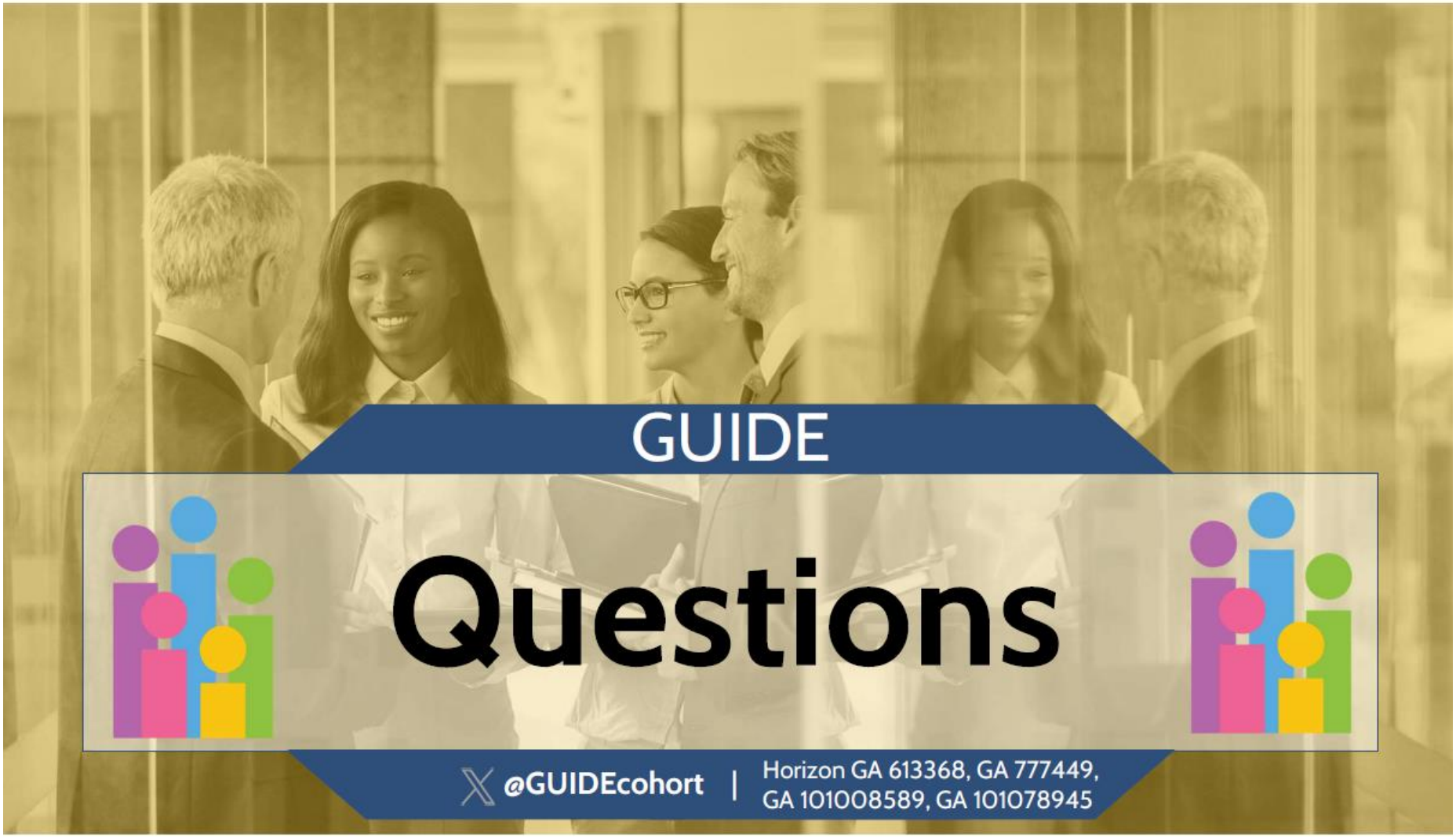
Italy
Latvia
Luxembourg
Malta
Norway
Portugal
Slovakia
Slovenia
Spain

Prospective members
Czech Republic
Denmark
Netherlands
Poland
Sweden
Switzerland
Iceland
Lithuania

Horizon GA 613368, GA 777449, GA 101008589, GA 101078945

International partners

Nº	Participant Organisation Name	Country
1 (Lead)	University College Dublin (UCD)	Ireland
2 (Co-Lead)	Manchester Metropolitan University (MMU)	United Kingdom
3	University of Bologna (UNIBO)	Italy
4	Ivo Pilar Institute of Social Sciences (IPI)	Croatia
5	Helsingin Yliopisto (HU)	Finland
6	Institut National D'Etudes Demographiques (INED)	France
7	German Youth Institute (DJI)	Germany
8	Federal Institute For Population Research (BIB)	Germany
9	Universidad Pompeu Fabra (UPF)	Spain
10	Stichting Centerdata (CD)	The Netherlands
11	Glasgow Caledonian University (GCU)	United Kingdom
12	Research Institute for Work and Society (HIVA)	Belgium
13	University of Antwerp (UA)	Belgium
14	Tallinn University (TLU)	Estonia
15	Panteion University of Social and Political Sciences (PUSPS)	Greece
16	University of Debrecen (UD)	Hungary
17	Daugavpils University (DU)	Latvia
16	Luxembourg Institute of Socio-Economic Research (LISER)	Luxembourg
19	University of Malta (UM)	Malta
20	Norwegian University of Science and Technology (NTNU)	Norway
21	Instituto Universitário de Lisboa (ISCTE)	Portugal
22	Univerzita sv. Cyrila a Metoda v Trnave (UCM)	Slovak Republic
23	Science and Research Centre Koper (KOPER)	Slovenia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Questions
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